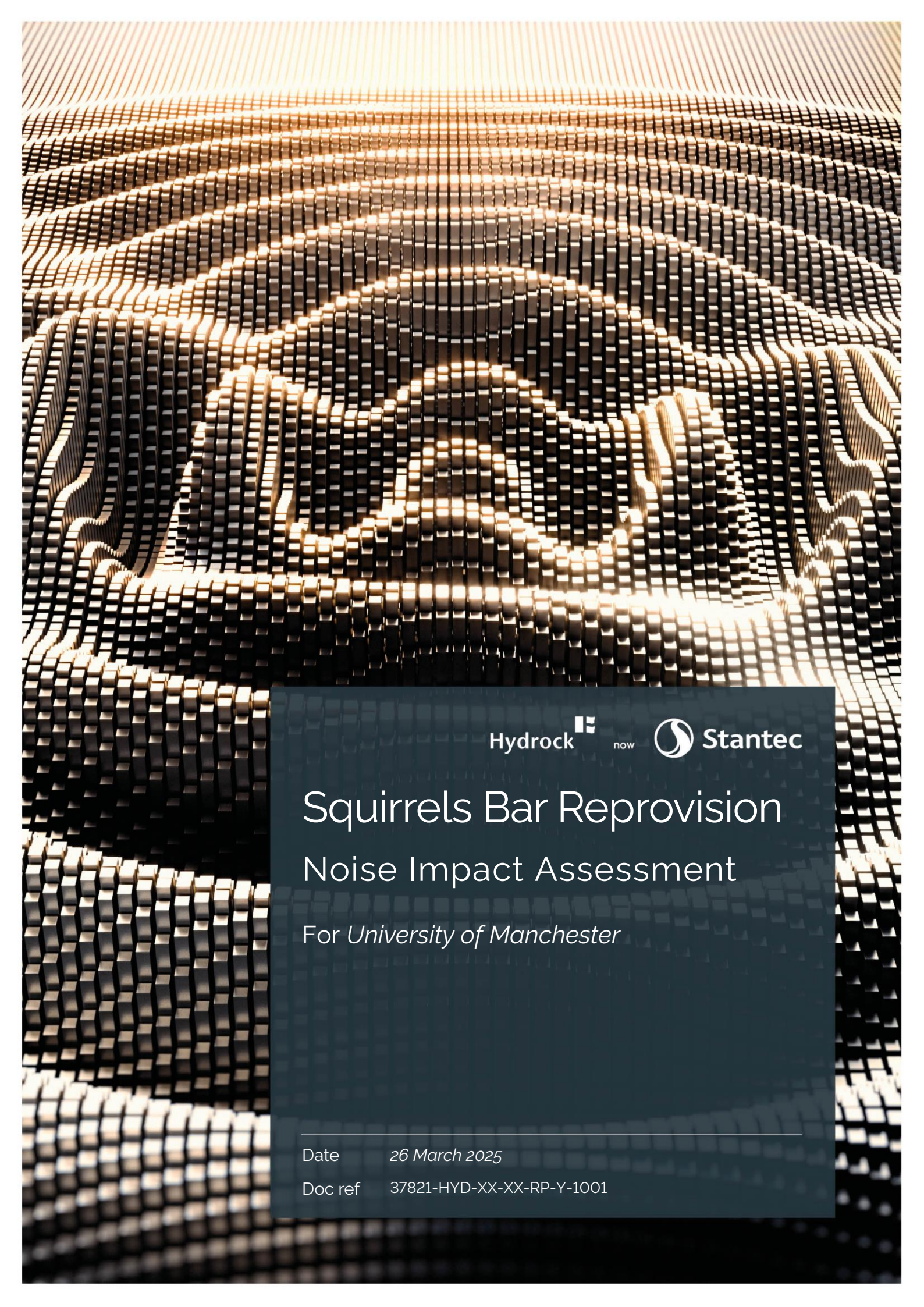




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Stantec

Squirrels Bar Reprovision Noise Impact Assessment

For University of Manchester

Date 26 March 2025

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1. Introduction

Hydrock now Stantec (HnS) have been appointed by Rider Levett Bucknall (RLB) to carry out a noise impact assessment in support of the planning application for the proposed relocation of Squirrels Bar ('Proposed Development'), which is proposed to be temporarily located off Chancellors Way, adjacent to the Armitage Sports Centre, within the University of Manchester (UoM) Fallowfield Campus (hereafter the 'Site').

The Proposed Development description is as follows:

'The University of Manchester (UoM) is considering the temporary re-provision of the Squirrels Bar, a key student social and events facility, to facilitate the demolition of the existing bar as part of the DBFO redevelopment of the Fallowfield Campus. The new facility is required to be fully operational by September 2025 and remain in use until July 2028, ensuring continuity of services and minimising disruption to students.'

The University has decided to proceed with a portal steel frame, single-storey solution, with a GIA 400-500m² (TBC). The solution will ensure a fully operational bar and events space, within the approved budget and critical timeline, providing a lifespan of 10 years which gives the University the opportunity to re-purpose beyond 2028.'

This report is technical in nature; therefore, a glossary of acoustic terminology is provided in **Appendix A**.

1.1 Existing Site Context

The Site is located on land within the Fallowfield Campus of The University of Manchester. To the north, the site is bordered by existing single storey storage buildings, with Unsworth Park, four storey student accommodation beyond. To the east, the site is bordered by The Armitage Sports Centre and open land, with a mixture of car parking and sports facilities beyond. To the south, the site is bordered open land, with sports facilities beyond. To the west, the site is bordered by Chancellors Way, with Firs Botanical Grounds and Uttley House beyond.

1.2 Proposed Operations

The Site location and Proposed Development general arrangement plan is shown in **Figure 1**.

The Proposed Development will comprise a new single storey building with a 343m² open plan bar / events space. The type of events expected to take place at the Proposed Development include:

- » Comedy nights
- » Sport (Champions League, Six nations, etc)
- » Sports team socials
- » Society socials
- » Quiz nights
- » Band nights/open-mic nights
- » Community building
- » Student friendships
- » Welcome Week

Proposed operating times are 1000-0300 hours, 7 days a week.



 RIDER LEVETT BUCKNALL | SQUIRRELS BAR REPROVISION
UOM

1:500

2. Assessment Methodology

This assessment considers the following potential noise impacts:

- » Noise and vibration impacts associated with the construction on Existing Sensitive Receptors (ESRs);
- » Noise impacts associated with entertainment events at the Proposed Development, at existing sensitive receptors; and,
- » Noise impacts from fixed plant associated with the Proposed Development at ESRs.

2.1 Current Policy and Guidance

Relevant policy and guidance documents considered within this assessment are listed below:

- » National Planning Policy Framework, 2024 (NPPF);
- » Noise Policy Statement for England, 2010 (NPSE);
- » Planning Practice Guidance - Noise, 2019 (PPG);
- » World Health Organisation (WHO) 1999: Guidelines for Community Noise;
- » British Standard 5228:2014 Parts 1 & 2 – 'Code of practice for noise and vibration control on construction and open sites – Noise and Vibration (BS5228);
- » British Standard 8233:2014 – 'Guidance on sound insulation and noise reduction for buildings' (BS8233);
- » Manchester City Council (MCC) – Planning and Noise Technical Guidance, October 2022

The relevant policy and assessment criteria as set out by MCC is described in further detail below. A full summary of all policy and guidance listed above is provided in **Appendix B**.

2.1.1 Local Planning Policy – Manchester City Council

MCC Core Strategy Development Plan 2012-2027

The Core Strategy Development Plan Document 2012 -2027 (Core Strategy) forms the basis of Manchester's Local Development Framework and sets out the long-term strategic planning policies for Manchester's future development. The Core Strategy replaces significant elements of MCC'S Unitary Development Plan (UDP), however some policies set out in the UDP are still in place.

The key policies from the Core Strategy and UDP relating to the Proposed Development are Policy DM1 (Development Management) and Policy DC26 Citywide Development Control Policies (Development and Noise) A short summary of the relevant elements of these policies is provided below.

Policy DM1 (Development Management)

This policy states that any new development shall have regard to effects on amenity, including privacy, light, **noise**, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.

Policy DC26 of the UDP (Development and Noise)

The policies falling under DC26 of the UDP outline the expectation for the new development to consider where existing noise source might result in an adverse impact upon a proposed new

development, or where a new proposal might generate potentially unacceptable levels of noise. In such cases, any assessment provided to the Council shall demonstrate that suitable measures have been taken in the design process to satisfactorily mitigate potential noise impacts.

These policies also reflect the 'Agent of Change' principle, as defined in the NPPF. Any new development (sensitive or otherwise) should consider the existing environment and be designed so as not to prejudice or cause conflict between existing businesses or cultural uses and the proposed development.

2.1.2 *MCC, Planning and Noise Technical Guidance (October 2022)*

The MCC Planning and Noise Technical Guidance document provides guidance on assessment relating to noise from or affecting new developments in the Manchester City region. Section 3.7.1.2 of the document relates specifically to the assessment of entertainment noise and is considered relevant to the Proposed Development.

The guidance states that the assessment of noise impacts from a new entertainment venue upon nearby existing sensitive receptors should consider both the overall noise level at the receptor as well as noise emissions specifically in the 63 Hz and 125 Hz octave bands.

The technical guidance provides two sets of criteria to consider where assessing noise emissions from new entertainment uses, these are summarised below:

"... a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be:

'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB ($L_{eq,5min}$), respectively'.

This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue"

"A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

'Entertainment noise ($LA_{eq,5min}$) should be controlled to 5dB below the typical background noise level (LA_{90}) in each octave band at the nearest noise sensitive location'.

Depending on the circumstances it could be that both the above criteria are applicable for the same development (new entertainment venue)."

The purported aim of both criteria is to ensure that entertainment noise levels are 'inaudible' / 'virtually inaudible' at the nearest sensitive receptor location. Further discussion is provided in **Section 4.2**.

2.2 Existing Sensitive Receptors

Following a review of aerial imagery around the Site, the nearest ESRs have been identified for the purposes of this assessment and are presented as **Figure 2** and described in **Table 2** below.

Table 1: Nearest Existing Sensitive Receptors to the Site

Reference	Description / Address	Approximate Co-ordinates		Approx. Distance and Bearing from Site boundary
		X (Easting)	Y (Northing)	
ESR 1	Residential apartments on Gunnery Lane, Unsworth Park, Manchester M14 6FZ	386020	394176	26m, north
ESR 2	Firs Villa Student Accommodation, Richmond Park Whitworth Lane, Manchester, United Kingdom, M14 6YY	385964	394176	35m, west
ESR 3	Residential apartments at Uttley House, Fallowfield, Manchester M14 6NN	385964	394115	41m, south-west

Any impacts at ESRs other than those selected for the purposes of this assessment are considered to be less. Therefore, this is considered to present a robust assessment of potential impacts.



Key

Approximate Site Boundary

Proposed Monitoring Location

Existing Sensitive Receptor

Notes

Revisions

First Issue

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Client

Rider Levett Bucknall

Project

Squirrels Bar, UoM

Title

Figure 1: Noise Monitoring Locations and Existing Sensitive Receptors

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Scale

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Purpose

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Figure 1

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3. Environmental Noise Survey

3.1 Summary

A noise survey was carried out at the Site between Thursday 27th February and Monday 3rd March 2025. The noise survey comprised one unattended noise monitor set up to measure noise levels over both a typical weekday and weekend period at a location representative of the nearest identified ESRs.

The monitor was set up to continuously record A-weighted, time-equivalent, one-third octave band sound pressure levels – together with the L_{min} , L_{Fmax} , L_{10} and L_{90} indices noise levels – for the duration of the survey. The measurements were carried out with Class 1 integrating sound level meters with the microphone at least 1.2m above ground level and 3.5m away from any other reflecting surface. All meters were calibrated pre and post measurement, with no significant calibration drift (<0.5 dB).

All noise monitoring was carried out in general accordance with British Standard 7445-2 - *Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use*.

3.2 Monitoring Locations

Noise monitoring locations are illustrated on **Figure 2** and described in **Table 2**.

Table 2: Noise Monitoring Locations – October 2020

Monitoring Location	Description	Time Period	
		Start	End
ML1	Unattended measurement within the rear garden of Firs Villa student accommodation. This location was selected to establish the ambient and background sound levels representative of the adjacent existing sensitive receptors.	14:15 27/02/2025	09:00 03/03/2025

3.3 Survey Weather Conditions

All monitoring has been carried out during periods of appropriate weather conditions. Based upon observations taken during the set-up and decommissioning of the sound level meter, as well as additional historic weather data as sourced via Weather Underground¹, the weather conditions during the 4-day monitoring period were as follows:

- » Temperatures ranging between -1 – 11°C
- » Mainly overcast with some sunny spells
- » Wind speeds varying between 1 and 5ms⁻¹

¹ Archived historic weather data sourced from weather station Manchester Airport EGCC (approx. 10km south of Site). Accessed via: <https://www.wunderground.com/dashboard/pws/ISALFO1>; and <https://www.wunderground.com/history/daily/gb/altrincham/EGCC/>

3.4 Description of Existing Noise Environment

Observations made during the survey and a review of audio recordings made during unattended measurements identified the following significant noise sources contributing to the noise climate at the site:

Road Traffic: Cars passing by were intermittently audible on Chancellors Way and Gunnery Lane, with distant traffic noise from Moseley Road dominant for the remainder of the time.

Industrial/Commercial Noise: No industrial or commercial noise sources were discernible at the site. Fixed plant was identified approximately 15m away from the monitoring location however was not audible at the microphone position during the survey.

Other Sources: Bird song and distant aircraft movements were occasionally audible across the Site.

3.5 Summary of Measured Noise Levels

The results of the long-term unattended environmental noise monitoring results at location ML1 are summarised in **Table 3** below in terms of measured average ($L_{Aeq, T}$) noise levels.

Measured noise levels have been separated in to daytime (0700 to 2300) and night-time (2300 to 0700) categories, in accordance with current guidance, where appropriate.

Table 3: Summary of Daytime and Night-time Average Noise Levels

Monitoring Location	Time Period	Measured Average Noise Level dB $L_{Aeq, T}$
ML1	Day (0700 – 2300)	50
	Night (2300 – 0700)	47

Full results of the noise survey are available as **Appendix C**.

4. Noise Impact Assessment

4.1 Construction Phase

4.1.1 Overview

Activities associated with the construction phase of the Proposed Development have the potential to generate noise and vibration that may propagate beyond the Site boundary.

The nearest existing receptors to the site include existing residents adjacent to the north at Unsworth Park, and beyond the western site boundary (Firs Villa and Uttley House) which have the potential to be impacted by noise and vibration from activities associated with the construction phase of the proposed development. These receptors are considered in this assessment. Other receptors may be affected by noise and vibration, to an equivalent or lesser extent than those identified.

The magnitude of any impact will depend upon the distance of any activities to receptors and the proximity to the site-boundary, which will vary throughout the construction phase. Therefore, this assessment considers activities taking place adjacent to the site boundary in order to provide a robust representation of potential impacts.

At this stage, detailed information pertaining to site specific construction activities are not known. Activities at the Site, which could give rise to potential noise impacts typically include (but are not limited to):

- » Earthworks e.g. dumper trucks, dozers, excavators, backhoe loaders, breakers.
- » Construction of the Proposed Development including piling, construction of access roads, fabrication processes e.g., planning, sanding, routing, cutting, drilling and laying foundations.

The contractor undertaking the construction works has not yet been appointed. However, it is considered that the enabling and construction works are likely to be restricted to standard daytime working hours, i.e., between 08:00 and 17:00 Monday to Friday, 09:00 to 12:00 on a Saturday, with no work on Sundays or Bank Holidays.

4.1.2 Noise from Construction Activities

BS5228-1 provides guidance on significance criteria for assessing the potential noise impacts associated with the construction phase of projects. For the purposes of this noise assessment, the noise likely to be generated by the construction phase are assessed based on the significance criteria using the established using the BS5228-1 ABC method.

The ABC method for determining significance criteria requires the ambient noise levels in the vicinity of existing receptors to be determined. The ambient noise levels are rounded to the nearest 5dB(A) to determine the corresponding impact threshold category values shown in **Table 4**.

Table 4: Thresholds of Significant Impacts at Residential Receptors in Accordance with the 'ABC' Method of BS5228-1

Assessment Category Threshold Value	Threshold Value, dB		
	Category A[1]	Category B[2]	Category C[3]
Weekday Daytime (07:00 to 19:00) and Saturdays (07:00 to 10:00)	65	70	75

[1] Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.

[2] Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

[3] Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.

The appropriate noise impact threshold category and corresponding significant noise impact threshold value has been determined for each nearby sensitive receptor, based on measured daytime ambient noise levels, in accordance with the ABC method of BS5228-1 as detailed in **Table 5**.

Table 5: Appropriate Category Value for Existing Sensitive Receptors

Description of Receptor	Average Representative Measured Daytime Level, dB LAeq,T	Rounded Daytime Level to the Nearest 5 dB(A)	Appropriate Category Value, according to BS5228-1	Significant Noise Impact Threshold, dB LAeq, T
ESR1 Caledonia Mills Student Accommodation	54	55	A	65

Mitigation measures, in the form of methods of best practice, for the control of construction noise are provided in the Mitigation Section of this report, and should be implemented via a suitably worded Construction Environmental Management Plan (CEMP).

4.1.3 Vibration from Construction Activities

BS5228-2 indicates vibration can have a disturbing impact on nearby sensitive receptors, especially where particularly sensitive existing operations may be taking place. The significance of vibration levels at receptors is dependent upon the nature of the source e.g. where groundborne vibration is continuous in nature, there is greater likelihood of structural damage occurring compared to transient vibration of equivalent magnitude.

Human perception of vibration is extremely sensitive. People can detect and be annoyed by vibration before there is any risk of structural damage. Cases where damage to building has been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants.

As stated in BS5228-2 and as generally accepted, the threshold of vibration perception for humans is typically in the Peak Particle Velocity (PPV) range of 0.14 mms^{-1} to 0.3 mms^{-1} , and the level above which vibration may cause complaint is 1 mms^{-1} PPV within occupied residential dwellings.

Table 6 provides a summary of impact thresholds recommended by BS5228-2 for building occupants and building damage.

Table 6 Magnitude of Impact from Vibration

Magnitude of Impact	Free-field vibration, PPV mms^{-1}	BS5228-2 Reference	
		Building occupants	Building Damage
Negligible	<1.0	BS5228-2 states that vibration might just be perceptible in residential environments at 0.31 mms^{-1} .	
Small	1.0-4.9	BS5228-2 states that a level of 1 mms^{-1} in residential environments may cause complaint but can be tolerated if prior warning and explanation has been given to residents.	
Medium	5.0-9.9		BS5228-2 suggests 7.5 mms^{-1} for continuous vibration at very low frequency as the onset of cosmetic damage. Cautious threshold of 5 mm/s applied for threshold of significant effect.
Large	≥ 10.0	BS5228-2 states that vibration is likely to be intolerable (for humans) for any more than a brief exposure to this level.	

It has been considered that construction works may take place at a distance of 20m or less from the nearest residential buildings (ESR 1, ESR 2 and ESR 3), depending on where activities are taking place on the site. At this distance it is possible that vibration may be perceptible to the residents, depending on the specific construction activity and surrounding ground conditions, but is unlikely to be above the threshold of complaint.

Table 7 sets out the typical distances, based on historical field measurements presented in Annex D of BS5228-2 and '*D M Hiller and G I Crabb: Groundborne vibration caused by mechanised construction works*', at which vibration levels from common activities are likely to be just perceptible, depending on ground conditions.

Table 7: Distance at which Vibration may be Just Perceptible

Construction Activity	Distance from Activity at which Vibration may be Just Perceptible, metres
Vibratory Ground Compaction (Hiller & Crabb)	10-15

Should it be necessary to carry out any ground compaction at distances less than those at which they may be just perceptible, then a contractor should use best practicable means to reduce the levels of vibration. It would also be advisable to carry out vibration monitoring during these works.

Vibration from road going heavy construction vehicles do not typically cause any perceptible groundborne vibration, providing routes are well maintained.

Methods of best practice should be implemented with regards to minimising potential vibration levels generated during the construction period, with particular attention to any requirement for piling.

Mitigation measures, in the form of methods of best practice, for the control of construction vibration are provided in the Mitigation Section of this report, and should be implemented via a suitably worded Construction Environmental Management Plan (CEMP).

4.2 Entertainment Noise Impact Assessment

4.2.1 Methodology

To satisfy the MCC criteria for entertainment noise as outlined in **Section 2.1.2**, calculations have been carried out to determine the maximum permissible internal reverberant noise level within the Proposed Development event space during any scheduled entertainment event, based on MCC guidance, results of the noise survey and the proposed building envelope construction.

As discussed in **Section 2.1.2**, the intent of the two sets of criteria is to ensure that entertainment noise is 'inaudible / virtually inaudible' at the receptor location. Regarding low-frequency noise the MCC criterion states that levels of <47 and <41 dB $L_{Aeq,5mins}$ within residential dwellings would achieve the inaudibility criteria for music noise as per the Moorehouse Curve from NANR45. MCC guidance also refers to NR 15 which is considered to be "too stringent" within the MCC guidance, however, to ensure that impacts are minimised this has been adopted as the internal limit for octave bands above 125Hz.

In line with the entertainment noise criteria outlined in **Section 2.1.2**, the noise levels per octave band presented in **Table 8** shall not be exceeded within the nearest ESR habitable rooms with windows open.

Table 8: MCC Entertainment Noise Criteria to not be exceeded within habitable rooms of nearby ESRs with windows open

Time Period	Entertainment Noise Level Limits, Not to be Exceeded within Habitable Rooms of ESRs with Windows Open dB $L_{eq,T}$							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
1000 - 0300	47*	41*	26	19	15	12	9	7

Using the guidance and methodology set out in ISO12354 (2017) – 'Building acoustics — Estimation of acoustic performance of buildings from the performance of elements, Part 4: Transmission of indoor sound to the outside', calculations have been carried out to determine the maximum permissible internal noise level spectrum during entertainment events at the Proposed Development, which would ensure the criteria presented in **Table 8** are not exceeded within any of the identified ESRs as described in **Table 1**.

4.2.2 Calculation Assumptions

In accordance with MCC guidance, the calculations have assumed ESR windows will be open during live entertainment events at the Proposed Development.

The assumed attenuation per octave band through the ESR open window is presented in **Table 9** and has been taken from the research paper prepared by Napier University on behalf of DEFRA, titled 'NANR116: Open/Closed Window Research, Sound Insulation Through Ventilated Domestic Windows', April 2007.

The research paper provides data for various opening sizes and window types. To be robust, the data presented for opening A-1 with a 200,000mm² open area in Table 5-5 of the paper, has been adopted.

Table 9: Assumed octave band sound attenuation from an open window with 200,00mm² open area

Window Opening Type	Manufacturers Sound Reduction Performance, dB								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	D _{n,e} (C _i ;C _{tr})
Opening A-1 from Table 5-5 of NANR116 Research Paper, 2007.	16*	11*	12	19	17	20	21	21	19 (-1;-2)

**Note: 3 dB has been subtracted from the stated performance at 63 Hz and 125 Hz to account for the uncertainty in the quantity of absorption at these low frequencies within the receiving spaces*

The sound insulation performance of the proposed façade and roof constructions used in the calculations have been taken from Kingspan's manufacturers data sheet, provided in **Table 10** for clarity.

Note, it is understood that all façades will incorporate some glazed elements; however, for the purpose of these calculations, the entire façade system has been assumed to have the performance as stated in **Table 10**. In reality, it is likely that the glazed elements will provide a higher level of sound insulation than the Kingspan, particularly at low frequency, and will thereby increase the overall composite sound insulation of the façades.

Table 10: Proposed Kingspan Facade and Roof Sound Reduction Data

Construction Type	Manufacturers Sound Reduction Performance, dB								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	R _w
Kingspan QuadCore® KS1000RW Wall Panels and Kingspan KS1000RW Trapezoidal Eco Safe Insulated Roof Panel	20	18	20	24	20	29	39	47	25

4.2.3 Entertainment Noise Limits

Table 11 below presents the recommended internal reverberant noise limits to be adhered to during any entertainment event that takes place at the Proposed Development, based upon the calculations as described in the previous sections.

Table 11: MCC Octave Band Noise Level Limits for Entertainment Noise

Proposed Internal Reverberant Noise Limit at Squirrels Bar Unweighted Octave Band Noise Levels, dB $L_{eq,5min}$								
63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Overall
107	94	82	86	77	85	94	100	96 dBA

The above limits are typical of venues with similar operations and will ensure that noise impacts at the nearest ESRs would be insignificant.

Further recommendations with regard to management measures that can be taken for the purpose of meeting the noise criteria set out in **Table 8**, are provided in **Section 5**.

4.3 Noise Emissions from Proposed Fixed Plant

The location, type and number of fixed mechanical plant installations required for the operation of the Proposed Development is yet to be finalised. In the absence of this information, plant rating level limits have been set to avoid the potential for adverse impacts at the nearest identified ESRs.

The plant rating levels, as defined in accordance with BS 4124, should be controlled such that they do not exceed the average background sound level less 5 dB, at any nearby proposed or existing sensitive receptor. The level limits for ESRs are shown in **Table 12**.

Table 12: Atmospheric Plant Level Limits

Sensitive Receptor	Time Period	Existing Average Background Sound Level, L_{A90} dB	Rating Level Limit, dB, $L_{Ar,Tr}$
All ESRs	Daytime	40	35
	Night-time	37	32

The above noise limits would indicate a low impact in accordance with BS4142, depending on context. The responsibility to achieve the above would be with those undertaking the building works and proposals should be reviewed by a suitably qualified acoustician during Technical Design. The noise limits are subject to the final approval of MCC.

5. Mitigation and Recommendations

5.1 Demolition and Construction Phase

5.1.1 Noise

In order to reduce the potential impact of noise generated by the construction phase of the Proposed Development at existing receptor locations in the immediate vicinity of the Site, best practicable means (BPM) should be implemented during each phase of the construction works at the Site. The construction works should follow the guidelines in BS5228-1 and the guidance in BRE Controlling particles, vapour and noise pollution from construction sites, Parts 1 to 5, 2003.

The following measures should be implemented via a CEMP to minimise noise emissions:

- » When works are taking place within close proximity to the sensitive receptors identified, the screening of noise sources via the erection of temporary screens would be employed;
- » All machinery would be regularly maintained to control noise emissions, with particular emphasis on lubrication of bearings and the integrity of silencers;
- » Site staff would be made aware that they are working adjacent to a sensitive area and avoid all unnecessary noise due to misuse of tools and equipment, unnecessary shouting and radios;
- » As far as possible, the avoidance of two noisy operations occurring simultaneously in close proximity to the same sensitive receptor;
- » Adherence to any time limits imposed on noisy works by the local authority;
- » Implement set working hours during the week and at weekends;
- » Ensure engines are turned off when possible; and
- » Should construction activities need to be carried out during night-time hours, the local authority may include a planning condition that requests advance notice and details of any night working to be provided.

5.1.2 Vibration

As the programme and methodologies become more defined, demolition and construction vibration should be reviewed by a suitably qualified acoustician and a detailed strategy for control devised and implemented via the CEMP, where appropriate.

5.2 Operational Phase

Maximum permissible internal reverberant noise level limits for the daytime and night-time period have been set out in **Table 11**, which are based upon MCC recommended noise criteria for new entertainment venues. Based on the activities proposed within the venue it is expected that the internal noise levels would be well below the limits set during typical operations.

In the case of noisier activities, i.e., ticketed live music events, it is recommended that only one sound system is used no matter the style of music being played. This would allow management of the Squirrels Bar to have control over music levels in any case. If this recommendation is impracticable, a noise limiting device would be the alternative, so that individual artists/bands follow the guidance regarding recommended music levels.

Additionally, upon an occasion where a larger live music event is being held at the venue, it is recommended that the operator should provide information and communications to the nearest ESRs to ensure that they are aware of the parameters (i.e., start and end times) of the event.

Some considerations to take into account during the detailed design stages as a means of good acoustic design are as follows:

- » Select suitable external doors, e.g., solid core doors with head perimeter compression seals (or similar), and consider the use of lobbied entrance doors.
- » Avoid placing mechanical extracts on the north and western façades; if unavoidable, provide suitable atmosphere side attenuators.
- » Loudspeaker systems should not be directly mechanically fixed to the external building fabric - use resilient hangers.

Other best practise noise control measures which should be implemented where possible include:

- » Ensure all external doors remain closed when not in use
- » Noise from smokers and patrons in external areas to be actively managed
- » For events expected to generate significant levels of noise, written advance notice of scheduled live music events should be provided to all nearby residents by UoM Squirrels Bar management, as appropriate.

5.3 Proposed Plant

Plant noise limits have been set at 5 dB below the existing background sound level.

During the detailed design stages, it is recommended that consideration should be given to the location of external and/or externally terminating fixed plant, utilising inherent screening of the buildings to minimise the need for specific mitigation. It is also recommended that provisions be made for the selection of low noise equipment, silencers, screens and other attenuation measures where necessary.

6. Conclusion

Hydrock now Stantec have been appointed by Rider Levett Bucknall to carry out a noise impact assessment in support of the planning application for the proposed reprovision of Squirrels Bar, which is proposed to be temporarily located off Chancellors Way, adjacent to the Armitage Sports Centre, within the University of Manchester (UoM) Fallowfield Campus.

Assessment of the potential impacts of construction noise and vibration, together with noise impacts associated with the operational phase of the development have been carried out.

It's considered that noise and vibration associated with the construction phase of the Proposed Development can be controlled appropriately via a suitably worded CEMP. Details of the construction methods should be reviewed by a suitably qualified acoustician as they develop.

Daytime and night-time octave band internal reverberant noise limits have been set for entertainment noise sources within the Proposed Development, such that the noise level within the nearest ESRs from entertainment sources will be no higher than 5 dB below the typical background sound level in octave bands 250 Hz – 8kHz, and no higher than 47 dB and 41 dB within the 63 Hz and 125 Hz octave bands, respectively. Additional recommendations in terms of good acoustic design and management measures have been provided as a means of best practise for noise control during live music events.

To ensure that noise generated by any items of building services plant does not result in adverse effects at the nearest existing sensitive receptors, guideline noise level limits have been set based on the existing typical background level, in accordance with BS4142 and MCC guidance.

This report demonstrates that, providing the recommended mitigation measures set out herein are implemented, suitable acoustic conditions associated with the Proposed Development will be achieved, and any associated noise impacts from the Proposed Development upon ESRs would be negligible. Therefore, it's considered there are no noise grounds for refusal of this application.

Appendix A Glossary of Acoustic Terms

Term	Description
dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
LAeq	The concept of LAeq (equivalent continuous sound level) has until recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise. LAeq is defined as the (A-weighted) notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 30 minutes).
DnT,w	A single number quantity characterising the on-site airborne sound insulation performance of a construction, including transmission of sound via flanking paths (e.g. adjoining floors/walls). The higher the DnT,w of a construction, the better its airborne sound insulation performance; the higher the DnT,w requirement, the more stringent the criteria.
Rw	A single number quantity characterising the laboratory based airborne sound insulation performance of a construction, independent of transmission of sound via flanking paths. As with DnT,w, the higher the Rw, the better the sound insulation performance; the higher the Rw requirement, the more stringent the criterion.
RT,RT60, T or T60	The time, in seconds, for a sound to decay by 60dB.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure

Term	Description
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L_{max,T}	A noise level index defined as the maximum noise level during the time period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{90,T} or Background Noise Level	A noise level index defined as the noise level exceeded for 90% of the time over the time period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L_{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969.
BNL	The Basic Noise Level is the road traffic noise at a reference distance of 10 m from the road edge, expressed in terms of the LA10 statistical level (18-hour or one-hour), and calculated according by Calculation of Road Traffic Noise (CRTN) based on the traffic flow.
AAWT	Annual Average Weekday Traffic is the total number of vehicles annually (on Monday – Fridays) divided by the total number of weekdays in this period.
Rating Level (L_{Ar,Tr})	To BS 4142:2014+A1:2019, the rating level is defined as the equivalent continuous A-weighted sound pressure level produced by the specific sound source over a given reference time interval, Tr plus any adjustment for the characteristic features of the sound (tonality, impulsivity, etc).
NSR	A Noise Sensitive Receiver is any receiver that is classed as being sensitive to noise sources, (residential properties, churches, music studios etc).
R_w + C_{tr}	Weighted Sound Reduction index (R _w) with low frequency sound correction factor (C _{tr}). R _w + C _{tr} is used when increased control of low frequency sound sources is required such as amplified music, and traffic or aircraft noise

Appendix B Summary of Relevant Policy and Guidance

National Planning Policy Framework

The 'National Planning Policy Framework, July 2021, Ministry of Housing, Communities and Local Government' (NPPF) sets out the United Kingdom Government's planning policies for adoption in England and how they should be applied.

The main aims of the NPPF are set out in section 11, as stated below.

'Planning policies and decisions should:

- » Encourage multiple benefits from both urban and rural land, including through mixed use schemes and taking opportunities to achieve net environmental gains – such as developments that would enable new habitat creation or improve public access to the countryside;
- » recognise that some undeveloped land can perform many functions, such as for wildlife, recreation, flood risk mitigation, cooling/shading, carbon storage or food production;
- » give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;
- » promote and support the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively (for example converting space above shops, and building on or above service yards, car parks, lock-ups and railway infrastructure); and
- » support opportunities to use the airspace above existing residential and commercial premises for new homes. In particular, they should allow upward extensions where the development would be consistent with the prevailing height and form of neighbouring properties and the overall street scene, is well designed (including complying with any local design policies and standards), and can maintain safe access and egress for occupiers.'

The NPPF makes reference to guidance contained in 'Noise Policy Statement for England (NPSE), March 2010, Department for Environmental, Food and Rural Affairs' (NPSE). The NPSE is intended to apply to all forms of noise, other than noise occurring in the workplace and includes environmental noise and neighbourhood noise of all forms.

The NPSE provides advice regarding the impact of noise which should be assessed on the basis of adverse and significant adverse effect. However, the NPSE does not provide any specific guidance on assessment methods or the noise levels at which different effects would be applicable. Moreover, the document advises that it is not possible to have 'a single objective noise-based measure...that is applicable to all sources of noise in all situations'. It further advises that the sound level at which an adverse effect occurs is 'likely to be different for different noise sources, for different receptors and at different times.'

Noise Policy Statement for England (NPSE)

The NPSE is intended to apply to environmental noise and neighbourhood noise of all forms but excluding noise occurring in the workplace.

The NPSE cites concepts from toxicology and advises that impacts should be considered with regards to health effects and quality of life:

"There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

The NPSE does not provide any numerical thresholds for determining the magnitude of a noise impact. Moreover, the document advises that it is not possible to have "a single objective noise-based measure...that is applicable to all sources of noise in all situations". It further advises that the sound level at which an adverse effect occurs is "likely to be different for different noise sources, for different receptors and at different times."

British Standard 5228: 2014 - Code of Practice for noise and vibration control on construction and open sites

Noise from Construction Plant and Vehicles

Guidance on the assessment of noise from development sites is given in British Standard 5228-1:2009+A1:2014 "Code of Practice for noise and vibration control on construction and open Sites – Part 1: Noise" (BS5228-1), and BRE Controlling particles, vapour and noise pollution from construction Sites, Parts 1 to 5, 2003.

In addition to the guidance from the local authority, the Control of Pollution Act 1974 (COPA 1974) gives the local authority power to serve a notice under Section 60 imposing requirements as to the way in which works are to be carried out. This could specify times of operation, maximum levels of noise which may be emitted and the type of plant which should or should not be used.

However, it might be preferable for the chosen contractor to obtain prior consent under Section 61 of COPA 1974. Section 61 enables anyone who intends to carry out works to apply to the local authority for consent. Under Section 61 the local authorities and those responsible for construction work, have an opportunity to settle any problems, relating to the potential noise, before work starts.

The threshold of potential significant effect at a nearby noise sensitive receptor in accordance with BS5228-1, Appendix E, is set out in the table below. The level is based on the ambient noise level at the site, when rounded to the nearest 5dB. The limit value is then compared to the site noise level to determine the potential for effect.

Example threshold of potential significant effect at dwellings			
Assessment Category and Threshold Value Period ($L_{Aeq,T}$)	Threshold Value, in decibels (dB)		
	Category A ^{*1}	Category B ^{*2}	Category C ^{*3}
Night-time (23:00- 07:00)	45	50	55
Evening and weekends ^{D)}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Note 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise levels.

Note 2: if the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise.

Note 3: Applied to residential receptors only.

***1 Category A:** Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.

***2 Category B:** Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

***3 Category C:** Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.

Vibration from Construction Plant and Vehicles

Human Response to Vibration

Guidance on the assessment of vibration from development sites is given in British Standard 5228-2:2009+A1:2014 "Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration" (BS5228-2).

Human beings are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity (PPV) range of 0.14 mm.s^{-1} to 0.3 mm.s^{-1} . As vibration increases above these values, they can disturb, startle, cause annoyance or interfere with work activities.

BS6472 provides guidance on human response to vibration in buildings. However, BS6472 is based on BDV and weighted acceleration. For construction, it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based on the concern for potential building damage. Furthermore, since many of the empirical vibration predicted yield a result in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance. The BS5228-2 guideline construction PPV values, as measured at receptor locations, are set out in the table below.

Vibration Level A),B),C)	Effect
0.14 mms⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms⁻¹	Vibration might be just perceptible in residential environments.
1.0 mms⁻¹	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

A) The magnitude of the values presented apply to a measurement position that is representative of the point of entry into the recipient.

B) A transfer function (which relates to an external level to an internal level) needs to be applied if only external measurements are available.

C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

Structure Response to Vibration

Cases where damage to a building has been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants. People can detect and be annoyed by vibration before there is any risk of structural damage.

Guidance on the assessment of groundborne vibration on building structures is set out in BS7385-2 and BS ISO 4866:201.

The likelihood of vibration induced damage or nuisance will depend upon the nature of the source, the characteristics of the intervening solid and drift geology and the response pattern of the structures around the site.

Limits for transient vibration, above which cosmetic damage could occur, are given in terms of PPV, in the table below.

Transient vibration guide values for cosmetic damage			
Line (see Figure B.1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures Industrial and heavy commercial building	50mm/s at 4Hz and above	50mm/s at 4Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20 mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Note 1: Values referred to are at the base of the building

Note 2: For line 2, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.

Minor damage is possible at vibration magnitudes which are greater than twice those in the table, and major damage can to a building structure can occur at values greater than four times the values.

The values in the table are for transient vibration which does not give rise to resonant response in structures. Where the dynamic loading caused by continuous vibration gives rise to dynamic magnification due to resonance, especially in the lower frequencies, then the guideline values may be reduced by up to 50%.

BS 8233:2014 and World Health Organisation (WHO) Guidelines for Community Noise, 1999

For dwellings the main considerations are to protect sleep in bedrooms at night and to protect resting, listening and communicating in all rooms during the day. For noise without a specific character BS8233:2014 identifies desirable internal limits during the 8-hour night (2300-0700 hours) or 16-hour day time (0700-2300 hours) of 30dB L_{Aeq} and 35dB L_{Aeq} respectively.

For dwellings where windows may be opened, an internal target of 35 dB L_{Aeq} during the day, and 30 dB L_{Aeq} during the night, equates to around 50 dB L_{Aeq} and 45 dB L_{Aeq} during the day and night respectively outside noise sensitive rooms.

The BS8233:2014 noise limits are for noise without a specific character. The standard notes that people are often more tolerant of noise without a specific identifiable character and that noise from neighbours (or a specific businesses) can trigger "complex emotional reactions". Therefore, in the UK, the BS8233:2014 noise limits (which are derived from WHO Guidelines) are often applied only to what is termed "anonymous noise". That is, noise without a specific character and that cannot be easily identified as emanating from a single business, building, or neighbour.

It should be noted that the BS8233:2014 noise limits are derived from limits identified in the World Health Organisation (WHO) "Guidelines for Community Noise", which are applicable to annoyance.

Appendix C Noise Survey Results

